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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/539,646	THIAGARAJAN, ARVIND	
	Examiner	Art Unit	
	MEKONEN BEKELE	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03/10/2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-53* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05/15/2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06/15/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-53 are pending in this application.

Information Disclosure Statement

2. The information disclosure statement field on 06/15/2005 is in compliance with the provisions of 37 CFR 1.97, and has been considered and copies is enclosed with this Office Action

Priority

3. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in India on 12/15/2004. It is noted, however, that applicant has not filed a certified copy of the PCT/SG04/00411 application as required by 35 U.S.C. 119(b).

Drawings

4. The drawings filed on 06/15/2005 are accepted for examination.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35U.S.C.102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-25, 52 and 53 are rejected under 35 U.S.C. 102(b) as being anticipated by Thiagarajan, Patent No. WO 03/084205 A2, published on 10/09/2003.

As to claim 1, Thiagarajan teaches A method for compressing image data of an image **(page 1 line 1, a method and system of compressing image data and other highly correlated data streams)**, comprising

transforming the image data into a bit plane of first and second values**(page 12 lines 14-16, In the Repetition Coded Compression algorithm, each element is compared with the previous element, and based on a predetermined condition a value of "1" or " 0" is stored on the Bit-plane**)

comparing each image element with a previous image element and if they are equal, recording a first value into a bit plane; and if they are not equal, recording a second value into the bit plane (**page 12 lines 14-16, claim1);**

encoding repeating first and second values in the bit plane into a bit plane index (**Abstract, encoding the repetitions into a bit-plane index);** and

wherein the compressed image is able to be decompressed using the bit plane index and the bit plane**(Abstract, encoding the repetitions into a bit-plane index and encoding data values for storage, storing the compressed data in memory and retrieving the data for decompression).**

As to claim 2, Thiagarajan teaches comparing each image element with a previous image element**(page 13 lines 19-20, the adjacent pixels are not only compared for repetition, but also for the difference value)** and if they are within a predetermined range of each other, modifying the image element to be equal to the previous image element(**page 14 lines 1-2, If the difference value between adjacent pixels is lesser than a given arbitrary threshold value, then the two adjacent pixels are made as the same**).

where repetition is increased (**page 14 lines 2-3, making the two adjacent pixels the same increases the number of repetitions in the image data)** to enable lossy compression of the image (**page 14 lines 4-7, the value of the threshold can be varied according to the requirements of the particular application and system. The higher the threshold, the better the compression ratio and also higher loss in the quality of the reconstructed image. Thus, the compression is lossy**).

As to claim 3, Thiagarajan teaches the comparison of the image elements is performed in raster order, from left to right **(Fig. 7, page 11 lines 1-4, Figure 7 shows the application of Repetition Coded Compression (RCC) along the horizontal direction in the image matrix.)** and then top to bottom **(Fig. 8, page 11 lines 5-7, Figure 8 shows the application of RCC along the vertical direction in the image matrix).**

As to claim 4, Thiagarajan teaches ,the transformation is a repetition coded compression horizontal transformation **(Fig. 7, page 11 lines 1-4, Figure 7 shows the application of Repetition Coded Compression (RCC) along the horizontal direction in the image matrix.)**, repetition coded compression vertical transformation **(Fig. 8, page 11 lines 5-7, Figure 8 shows the application of RCC along the vertical direction in the image matrix.)**, repetition coded compression predict transformation, repetition coded compression adaptive transformation or a repetition coded compression multidimensional transformation (**claim 7, Fig.9, Figure 9 shows the application of RCC in to two- dimension, both horizontal and vertical directions).**

As to claim 5, Thiagarajan teaches each image element is a pixel (**claim 2**)

As to claim 6, Thiagarajan teaches the first value is a 1, and the second value is a 0 **(Claim 3).**

As to claim 7, Thiagarajan teaches ,the repetition coded compression horizontal transformation **(Fig. 7, page 11 lines 1-4, Figure 7 shows the application of Repetition Coded Compression (RCC) along the horizontal direction in the image matrix.)**, repetition coded compression vertical transformation **(Fig. 8, page 11 lines 5-7, Figure 8 shows the application of RCC along the vertical direction in the image matrix.)**, repetition coded compression predict transformation, repetition coded compression adaptive transformation or a repetition coded compression multidimensional transformation (**claim 7, Fig.9, Figure 9 shows the application of RCC in to two- dimension, both horizontal and vertical directions),** a single bit plane is used to store the values (**Claim 5, for a one-dimensional compression a single bit plane is used to store the values).**

As to claim 8, Thiagarajan teaches for the repetition coded compression multidimensional transformation, comparison is in both horizontal and vertical directions, and a separate bit plane is used for each direction **(Claim 6)**

As to claim 9, Thiagarajan teaches the bit-planes for the horizontal and vertical directions are combined by binary addition to form a repetition coded compression bit-plane **(Claim 7)**.

As to claim 10, Thiagarajan teaches the combining is by binary addition, only the second values being stored for lossless reconstruction of the image **(Claim 8)**.

As to claim 11, Thiagarajan teaches the result of the combining is repetition coded compression data values, all other image data values being able to be reconstructed using the repetition coded compression data values, and the bit planes for the horizontal and vertical directions**(Claim 9).**

As to claim 12, Thiagarajan teaches storage in bit planes is in a matrix **(Claim10).**

As to claim 13, Thiagarajan teaches a single mathematical operation is performed for each image element (**Claim 11**).

As to claim 14, Thiagarajan teaches the repetition coded compression predict transformation (**page 8 lines 12-15, Repetition Coded Compression comparison with arbitrary threshold value)**, a mapping value is used to replace repeating image elements (**page 8 lines 12-15, If the difference value between adjacent pixels is lesser than a given arbitrary threshold value, then the two adjacent pixels are made as the same.** The mapping value **corresponds to the same value that represents the two adjacent pixels)**.

As to claim 15, Thiagarajan teaches the mapping value is a value that does not exist in the bit plane (**Claims 1 and 2, In the Repetition Coded Compression algorithm, each element is compared with the previous element, if they are both**

equal, a first value is recorded. Thus, the second value is not recorded. The second value **corresponds to the mapping value).**

As to claim 16, Thiagarajan teaches the mapping value is a value that exist in the bit plane (**Claim 1 and claim 2, In the Repetition Coded Compression algorithm, each element is compared with the previous element, if they are not both equal, a second value is recorded.** The second value **corresponds to the mapping value).**

As to claim 17, Thiagarajan teaches if the image element is equal to the previous image element and not equal to the mapping value, the image element is replaced with the mapping value **(page8 lines 12-14, If the difference value between adjacent pixels is lesser than a given arbitrary threshold value, then the two adjacent pixels are made as the same.** The mapping value **corresponds to the same value that represents the two adjacent pixels).**

As to claim 18, Thiagarajan teaches if the image element is equal to the mapping value and equal to the previous image element, the image element is replaced(**claim 1 and calim2, In the Repetition Coded Compression algorithm, each element is compared with the previous element, if they are both equal, a first value is recorded**).

As to claim 19, Thiagarajan teaches if image element is equal to the mapping value and not equal to the previous image element, the image element is replaced with the previous image element **(page8 lines 12-14, If the difference value between**

adjacent pixels is lesser than a given arbitrary threshold value, then the two adjacent pixels are made as the same).

As to claim 20, Thiagarajan A system for compressing image data of an image **(Abstract, system of compressing image data and other highly correlated data streams,)** comprising:

a data transforming module to transform the image data into a bit plane of first and second values by comparing each image element with a previous image element **(page 12 lines 14-16, In the Repetition Coded Compression algorithm, each element is compared with the previous element, and based on a predetermined condition a value of "1" or " 0" is stored on the Bit-plane**)

and if they are equal, recording a first value into the bit plane; and if they are not equal, recording a second value into the bit plane (**page 12 lines 14-16, Claim1);**

a data rearranging module to rearrange the transformed image data by causing elements of the image data to be repetitive (**Claim 14);** and

an encoder to encode repeating first and second values (**Claim 1)** in the bit plane into a bit plane index (**Abstract, encoding the repetitions into a bit-plane index**)

wherein the compressed image is able to be decompressed using the bit plane index and the bit plane **(Abstract, encoding the repetitions into a bit-plane index and encoding data values for storage, storing the compressed data in memory and retrieving the data for decompression).**

As to claim 21, Thiagarajan teaches the number of elements repeated is dependant upon a predetermined level of image quality selected for the compressed image(**page 8 lines 10-20, In case of a lossy system of implementation, the**

difference value between adjacent pixels is compared with a given arbitrary threshold value. The value of the threshold can be varied according to the requirements of the particular application and system. The higher the threshold, the better compression ratio and also higher loss in the quality of the reconstructed image. The number of repetition in the image data depends on the threshold value and the difference value between adjacent pixels).

As to claim 22, Thiagarajan teaches a source coder to receive the rearranged data as input (**Fig. 1, Claim 14**, **reshaping the digital data into a digital data matrix; and then encoding repetitions in the digital data matrix into a bit-plane index. The rearranged data corresponds to the digital data matrix**. The source coder **corresponds to the RCC algorithm implementation block**).

,

As to claim 23, Thiagarajan teaches the source coder comprises an arithmetic coder preceded by a run length encoder **(Claim 6, A method of repetition coded compression for combining the said horizontal and said vertical bit-planes by a said binary addition operation to result in the said RCC bit-planes. Thus, the arithmetic coder is included in the RCC algorithm implementation block. After binary addition operation, the repetition codes are generated as bit-planes. Thus, the run length encoder that generates the bit-planes and the arithmetic coder are connected in series).**

As to claim 24, Thiagarajan teaches a camera for capturing at least one image and for supplying digital data to the data transforming module (**Claim 12: section a**);

a reshaping block for rearranging the digital data into a matrix of image data values **(Claim 12: section b)**;

a processor for receiving the matrix of image data values and compressing the image data values to form compressed data **(Claim 12: section c)**; and a memory for storing the compressed data **(Claim 12: section d).**

As to claim 25, Thiagarajan teaches the camera is analog, and the system further comprising an analog-to-digital converter to convert the analog image into digital data **(Claim 13).**

As to claim 52, Thiagarajan teaches the predetermined level of image quality is user defined (page **17 lines 2-9, If the difference value between adjacent pixels is lesser than a given arbitrary threshold value, then the two adjacent pixels are made as the same. The value of the threshold can be varied according to the requirements of the particular application and system. The higher the threshold, the better the compression ratio also higher loss in the quality of the constructed image).**

As to claim 53, Thiagarajan teaches wherein the method is used for an application selected from the group consisting of: medical image archiving, medical image transmission, database system, information technology, entertainment, communications applications, and wireless application, satellite imaging, remote sensing, and military applications**(Claim 21)**

6. Claims 26, 27,30,32,33 and 36 are rejected under 35 U.S.C. 102(b) as being anticipated by Ordentlich et al. US Patent No. 6,263,109 B1.

As to claim 26, Ordentlich teaches A method for decompressing compressed data **(col.1 lines 18-19, Lossless data compression algorithm. The algorithm is a class of data compression algorithms that allows the exact original data to be reconstructed (decompressed perfectly) from the compressed data**.) comprising

run-length decoding the compressed data **(col. 8 lines 66-67, the Run subsequence could be further decomposed into two additional subsequences.)**

arithmetically decoding the compressed data **(col. 10 lines 65-66, arithmetic encoding of the subsequences could be performed. The First and the second computers carry out the encoding and decoding process respectively (Fig. 8).The arithmetic encoding of the subsequences is performed by the first computer. Thus, the arithmetic decoding of the subsequences is performed by the second computer);**

reverse transforming the decoded data **(col.10 lines 14-15**, **The embedded bitstream may be decoded by reversing the method used to generate the bitstream.** The reverse transforming **corresponds to the wavelet transforming (col.3 lines 44-45);**

rearranging the transformed decoded-data (**col.9 lines 59-60, the separate bitstreams may be re-arranged offline (on byte boundaries) for optimal embedding.)** into a lossless decompressed form **(col.1 lines 18-19).**

As to claim 27, Ordentlich teaches the reverse transformation (**col.3 lines 44-45 the wavelet transformation**) is one dimensional including a horizontal variant, a vertical variant**(col.3 lines 45-48, at a first level of decomposition, image data is filtered by high pass and low pass filters, both horizontal and vertically.)**, or a predict variant

As to claim 30, Ordentlich teaches the compressed data is image data **(col.3 lines 45-48, image data is filtered by high pass and low pass filters**).

As to claim 32, Ordentlich teaches A system for decompressing compressed data (**Fig. 8, col.1 lines 17-20**, **Figure 8 illustrates encoder/decoder system that includes lossless data compression. The decoder decompress a compressed data**), comprising

a run-length decoder (**col.13 claim 32**, **the encoding means includes an adaptive run length encoder, and the encoded subsequences being placed in the bitstream as ordered (col. 13 claim 33). Further the subsequences are adaptive run length coded** (**col.14 claim 39 .** Thus, the run-length decoder **corresponds to the adaptive run length coder**) and an arithmetic decoder **(col. 10 lines 65-66, Fig.8. The First computer and the second computer carried out the encoding and decoding process respectively. The arithmetic encoding of the subsequences is performed by the first computer. Thus, the arithmetic decoding of the subsequences is performed by the second computer.)** for decoding the compressed data

rearranging the transformed decoded-data (**col.9 lines 59-60, the separate bitstreams may be re-arranged offline (on byte boundaries) for optimal embedding.)** into a lossless decompressed form **(col.1 lines 18-19).**

Regarding claims 33 and 36, all clamed limitation are set forth and rejected as per discussion for claims 27 and 30.

Claim Rejections - 35 USC § 103

The following is a quotation of the 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained thought the invention is not identically disclosed or described as set forth in section 102 of this title, if the difference between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 28,31,34 and 37-51 are rejected under 35 U.S.C 103(a) as being unpatentable over Ordentlich et al., US Patent No. 6,263,109 B1, in view of Thiagarajan, Patent No. WO 03/084205 A2, Published on 10/09/2003.

As to claim 28, however it is noted that Ordentlich does not specifically teaches "the reverse transformation is two dimensional such as a multidimensional variant" **although suggest a lossless image wavelet transform (Abstract, col. 1 lines 18-20).**

On the other hand the Repetition coded compression for highly correlated image data of Thiagarajan teaches the reverse transformation **(page 4 lines 1-3, Because of the single mathematical operation involved for implementation of the**

present invention (Repetition Coded Compression), the system is perfectly reversible and absolutely lossless) is two dimensional such as a multidimensional variant **(page 7 lines 14-15, the system includes two-dimensional Repetition Coded Compression method).**

Regarding claim 34, all clamed limitation is set forth and rejected as per discussion for claim 28.

It would have been obvious to one the ordinary skill in the art at the time of applicant's invention was made to incorporate the method and system of compressing image data and other highly correlated data streams of *Thiagarajan* (page 1 lines 4-5) into Context-based ordering and coding of transform coefficient bit-planes for embedded bitstreams of Ordentlich (Abstract), because both *Thiagarajan and* Ordentlich are directed to data compression. More specifically, both inventions directed to the generation of embedded bitstreams from quantized Wavelet transform coefficients (Ordentlich: Abstract, Thiagarajan: page 3 lines3-7), and both are the same filed of endeavors.

As to claim 31, Thiagarajan teaches the image data originates from a photo, drawing or video frame **(Claim 21)**

Regarding claim 37, all clamed limitation is set forth and rejected as per discussion for claim 31.

As to claim 38, Thiagarajan teaches a portion of the image data is compressed lossless while the remaining portion of the image data is compressed lossy (**page 8 lines 5-7, In this Repetition Coded Compression algorithm, each element is compared with the previous element. If both of them are equal then a value of '1 ' is stored in a Bit-plane. Otherwise a value of '0' is stored in the Bit-plane. Further the zero values in the RCC bit-plane are the only ones that are to be stored for lossless reconstruction of the original image (page. 13 lines 13-14). Thus, part of the image can be stored for lossy reconstruction of the original image**)

As to claim 39, Thiagarajan teaches rearranged data is passed to an input of a source coder (**Fig. 1, Claim 14**, **reshaping the digital data into a digital data matrix; and then encoding repetitions in the digital data matrix into a bit-plane index. The rearranged data corresponds to the digital data matrix**. The source coder **corresponds to the RCC algorithm implementation block**).

As to claim 40, Thiagarajan teaches the source coder comprises an arithmetic coder preceded by a run length encoder **(Claim 6, A method of repetition coded compression for combining the said horizontal and said vertical bit-planes by a said binary addition operation to result in the said RCC bit-planes. Thus, the arithmetic coder is included in the RCC algorithm implementation block. After binary addition operation, the repetition codes are generated as bit-planes. Thus, the run length encoder that generates the bit-planes and the arithmetic coder are connected in series).**

As to claim 41, Thiagarajan teaches additional compression of the rearranged image data wherein each element is compared with a previous element and

(c) if they are equal, a first value is recorded; and

(d) if they are not equal, a second value is recorded (**Claim 1)**

As to claim 42, Thiagarajan teaches each image element is a pixel (**Claim 2**)

As to claim 43, Thiagarajan teaches the first value is a 1, and the second value is a 0, **(Claim 3).**

As to claim 44, Thiagarajan teaches the first and second values are stored in a bit plane (**Claim 4**).

As to claim 45, Thiagarajan teaches for a one-dimensional compression, a single bit plane is used to store the values (**Claim 5**).

As to claim 46, Thiagarajan teaches, for a two-dimensional compression, comparison is in both horizontal and vertical directions, a separate bit plane being used for each direction (**Claim 6**).

As to claim 47, Thiagarajan teaches the bit-planes for the horizontal and vertical directions are combined by binary addition to form a repetition coded compression bit-plane **(Claim 7)**

As to claim 48, Thiagarajan teaches the combining is by binary addition, only the second values being stored for lossless reconstruction of the image **(Claim 8).**

As to claim 49, Thiagarajan teaches the result of the combining is repetition coded compression data values, all other image data values being able to be reconstructed using the repetition coded compression data values, and the bit planes for the horizontal and vertical directions**(Claim 9).**

As to claim 50, Thiagarajan teaches storage in bit planes is in a matrix (**Claim10).**

As to claim 51, Thiagarajan teaches a single mathematical operation is performed for each element (**Claim11).**

8. Claims 29 and 35 are rejected under 35 U.S.C 103(a) as being unpatentable over Ordentlich et al., US Patent No. 6,263,109 B1, in view of Chen et al., Pub. No.: US2002/0084921 A1.

As to claims 29 and 35, however it is noted that Ordentlich does not specifically teaches "the rearrangement of the transformed decoded data comprises a reversible sort process and a last to first rearrangement", although Ordentlich suggests **a method of generating an embedded bitstream from quantized Wavelet transform coefficients includes the steps of separating the quantized coefficient bit-planes into a plurality of subsequences, ordering the subsequences according to**

decreasing expected distortion reduction per expected bit of description (Abstract).

On the other hand the Digital image compression and decompression system of Chen teaches the rearrangement of the transformed decoded data**(page1 [0008], A method of storing a block of transform coefficients in a buffer, the method comprising the steps of: re-arranging said block of transform coefficients into one or more sub-blocks of transform coefficients.** The transformed decoded data **corresponds to the block of transform coefficients)** comprises a reversible sort process **(page1 [0008], generating a lossless compressed representation of the block of transform coefficients.** The reversible sort process **corresponds to re-arranging the block of transform coefficients using lossless compression technique.)** and a last to first rearrangement **(page 5 [0056], re-arranging circuit 428 orders and outputs the code blocks along with header information as a single bitstream in accordance with JPEG2000).**

It would have been obvious to one the ordinary skill in the art at the time of applicant's invention was made to incorporate a code block manager (310) and entropy encoder (314) of Chen (Abstract) into Context-based ordering and coding of transform coefficient bit-planes for embedded bitstreams of Ordentlich (Abstract), because that would have allowed users of Ordentlich to reduces the amount of memory required for buffering the transform coefficients as the transform coefficients are generated as lossless compressed values such that the bit-planes of the transform coefficient is represented in compact form(page 1 [0007]).

Conclusion

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Mekonen Bekele whose telephone number is 571-270-3915. The examiner can normally be reached on Monday -Friday from 8:00AM to 5:50 PM Eastern Time.

If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor LE BRIAN can be reached on **(571) 272-7424.** The fax phone number for the organization where the application or proceeding is assigned is 571-237-8300.

Information regarding the status of an application may be obtained from the patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR.

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/MEKONEN BEKELE/
Examiner, Art Unit 2624
September 12, 2008

/Brian Q Le/

Primary Examiner, Art Unit 2624